

Green Energy: Understanding Current Energy Issues & Renewable Energy Options

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There is no status quo in energy.

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- Established by the General Assembly in 2007
- Seeks to help Iowans create an economically viable and environmentally sound energy future by:
 - Providing leadership through education, planning and investment
 - Developing policies and resources to produce market transformation
- Open for business on January 11, 2008

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Iowa Power Fund

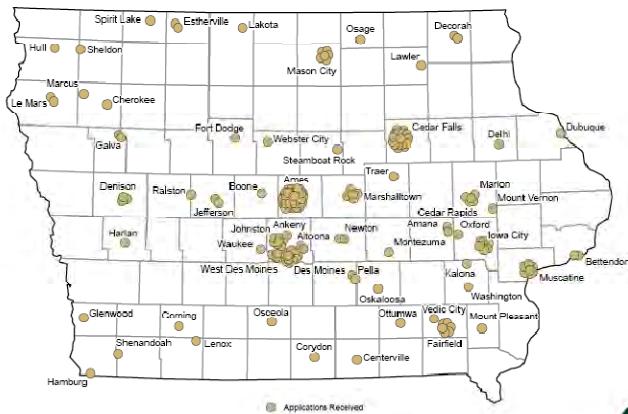
- \$100 million appropriated over 4 years
- Provides financial assistance to projects that will improve Iowa's biofuels, renewable energy, and energy efficiency sectors
- Board is comprised of 18 members who review and approve project applications

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First Year of the Power Fund

POWER FUND APPLICANTS



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WWW.ENERGY.IOWA.GOV



- Office has received 177 applications
- Applications totaled more than \$346 million in requests, with over \$1 billion in matching funds
- Projects totaling more than \$31 million were funded
- Additional \$183 million in private and federal funds were leveraged as of 1/13/09

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Additional Power Fund Allocations



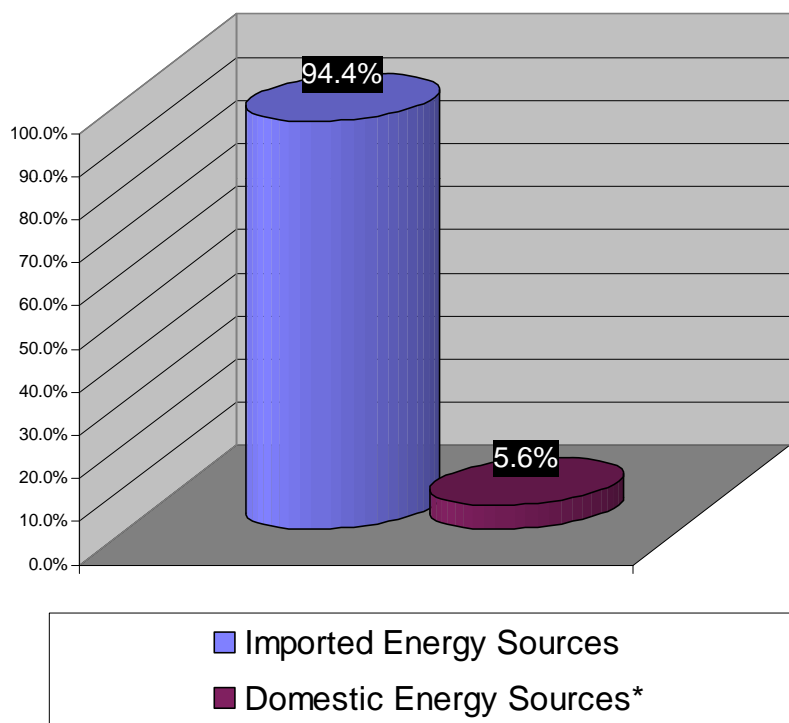
- **\$7.5 million** dedicated to rebuilding efforts after the 2008 floods
- Energy efficiency rebates available in affected areas
- **\$2.5 million** per year provided to support energy training and workforce development programs at Iowa community colleges

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The Time is Now

Iowa Energy Imports, 2005



- U.S. energy demand expected to increase by more than 1/3 by 2030
- Market fluctuation creates instability
 - Heating oil prices up 117% from 5 yrs ago
 - Propane prices up 86% from 5 yrs ago

* The domestic energy total includes "biomass", "ethanol", "hydroelectric power", and "other".

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Economic Implications of Energy Use

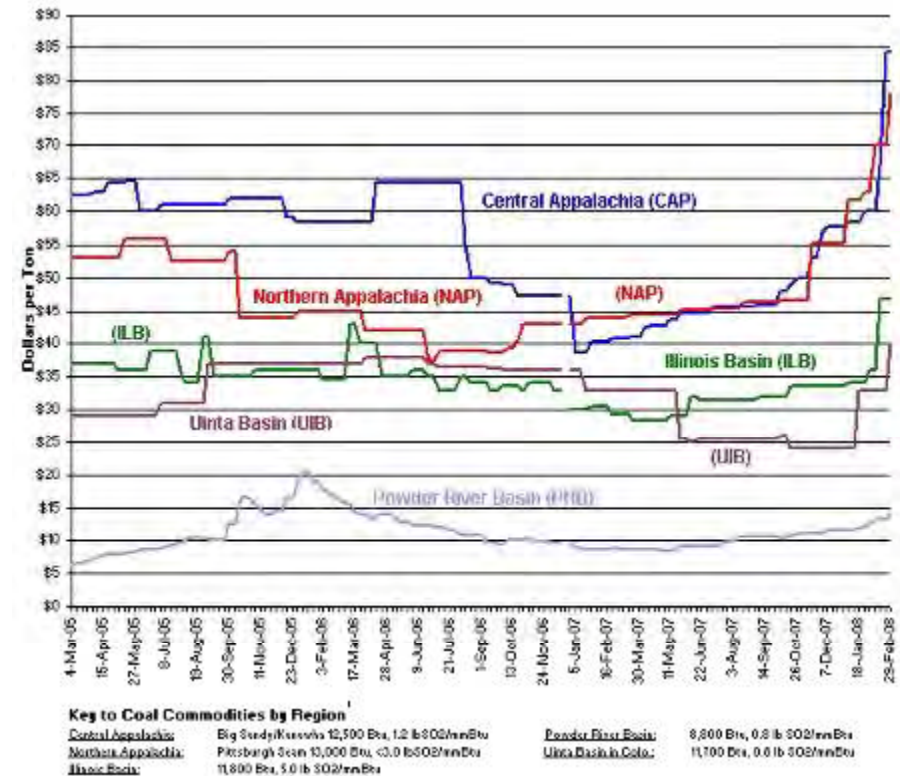
- Average family spends 19%-25% of household income on transportation
- Energy and fuel price fluctuations continue to severely impact the family budget
- Energy is an imbedded cost in every product and service

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Electricity Price Trends

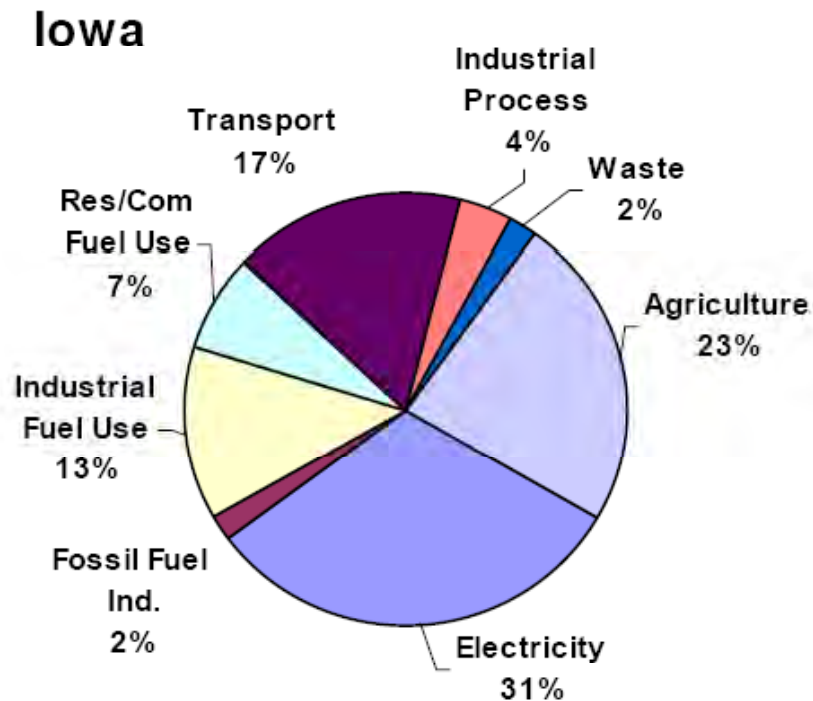
- Prices of electricity will go up – period, regardless of source
- Ignoring trend is irresponsible
- Long term plans
 - Accept trend
 - Manage trends with:
 - R & D
 - Job creation
 - Greenhouse gas reduction



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Environmental Implications of Energy Use



- Electricity sector emitted 31% of Iowa's gross greenhouse gas (GHG) emissions in 2005
- GHG emissions from electricity sector are expected to be the largest contributors in the future



Carbon-Based Fuel Sources

- Coal
- Petroleum
- Natural gas



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Electricity from Coal

- Coal is abundant in the U.S. and is a cheap source of energy
- Prices have been increasing

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Petroleum

- Currently seeing pressure from oil production cuts
- Price fluctuation will continue
 - FY08: largest fluctuations in oil prices

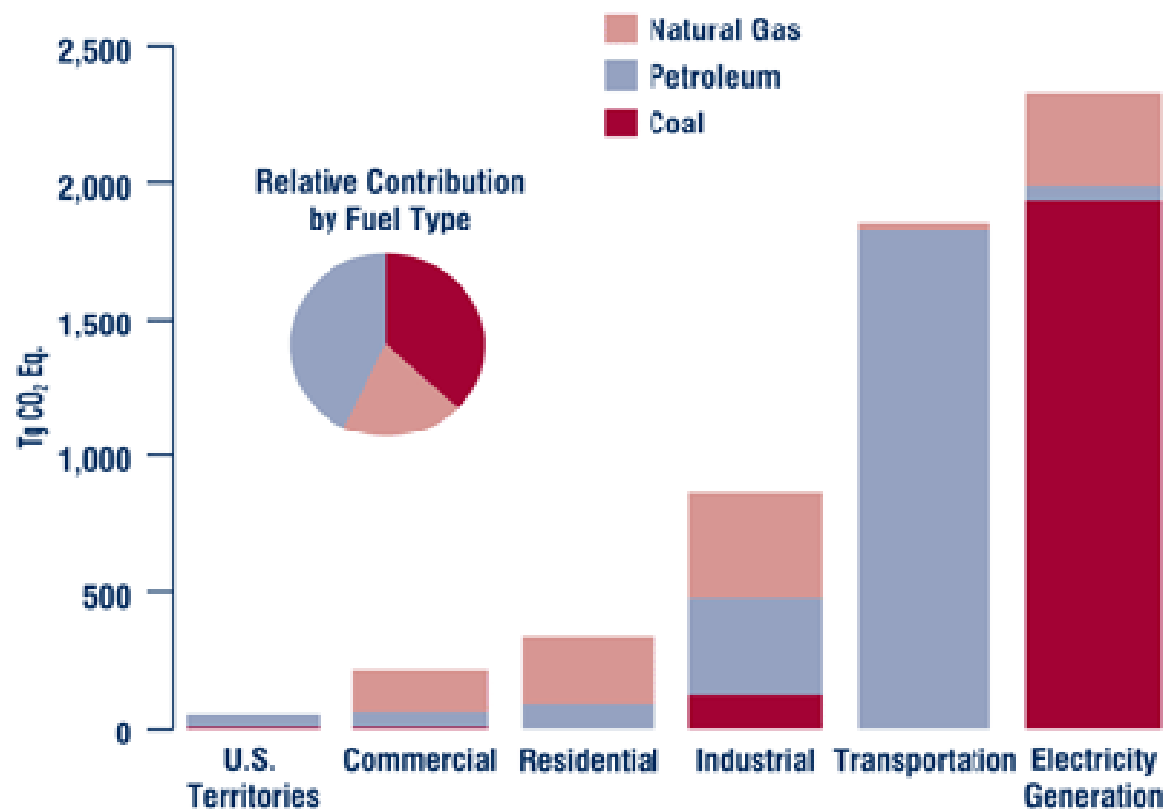


Natural Gas

- Dramatic price fluctuations
 - Ranges from \$4.50 to \$13.00/MMBtu
 - As of 3/26/09: \$3.76/MMBtu
- Unlikely to remain low over the long term



2006 CO₂ Emissions from Fossil Fuel Combustion by Sector and Fuel Type



Note: Electricity generation also includes emissions of less than 0.5 Tg CO₂ Eq. from geothermal-based electricity generation.

Source: [U.S. Greenhouse Gas Emissions Inventory](#) (y-axis units are teragrams of CO₂ equivalent)

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Future Carbon Policy

- Expect carbon pricing, impacting all fossil resources
 - Conservative estimations: \$22-\$44 per ton
 - With an aggressive carbon policy: up to \$200 per ton

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Renewable Energy Credit

- Tradable environmental commodities in the United States which represent proof that 1 megawatt-hour (MWh) of [electricity](#) was renewable.
- Can be sold and traded and the owner of the REC can claim to have purchased renewable energy
- RECs can incentivize carbon-neutral renewable energy by providing a production subsidy to electricity generated from renewable sources.

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Renewable Energy Credit

- In states which have a REC program, a green energy provider (such as a wind farm) is credited with one REC for every 1,000 kWh or 1 MWh of electricity it produces
- Prices depend on many factors: supply/demand; whether the REC is used for RPS compliance; how it was created; who the certifier is.

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What is Green Energy?

- Sources of energy that are environmentally-friendly
- Examples:
 - Wind, solar, anaerobic digestion, biofuels, etc
- Energy efficiency as a “first fuel”

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Green Energy in Iowa

- Iowa's green energy production has increased by 185% in the last decade as a result of strong growth in biofuels and wind production
- Iowa is ranked 5th in the nation in spending on electricity efficiency programs

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Defining “Green”



Money

&



Environment

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Energy Efficiency

- Keeps money in local economy
- In Iowa, for each \$1 million invested in energy efficiency:
 - 25 job years created
 - \$1.50 of additional disposable income per \$1 invested

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Promote Smart Growth-Existing Development

- Encourage development in existing communities
 - Increased efficiency of already developed land and infrastructure
 - Take advantage of existing infrastructure



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Smart Growth Policies-Technology

- Capitalize on advanced telecommunication technologies
 - Work from home
 - Satellite offices
 - Work hub



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LEED CORE CURRICULUM



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What is “Net Zero?”



- “Zero energy” buildings are those, that at the very least, will generate as much energy as it consumes on an annual basis. ZEBs can be totally self-sustaining (grid-independent), or even net exporters of energy.



Net Zero Ready

- Planning for future building improvements
- Making the building as energy efficient as possible
- LEED platinum energy points = exceeding building energy codes

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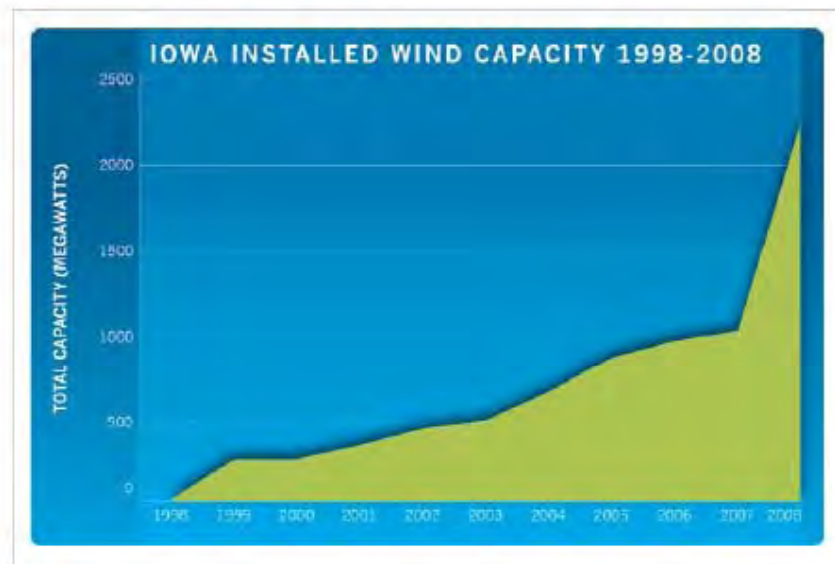
Iowa's Wind Energy Industry



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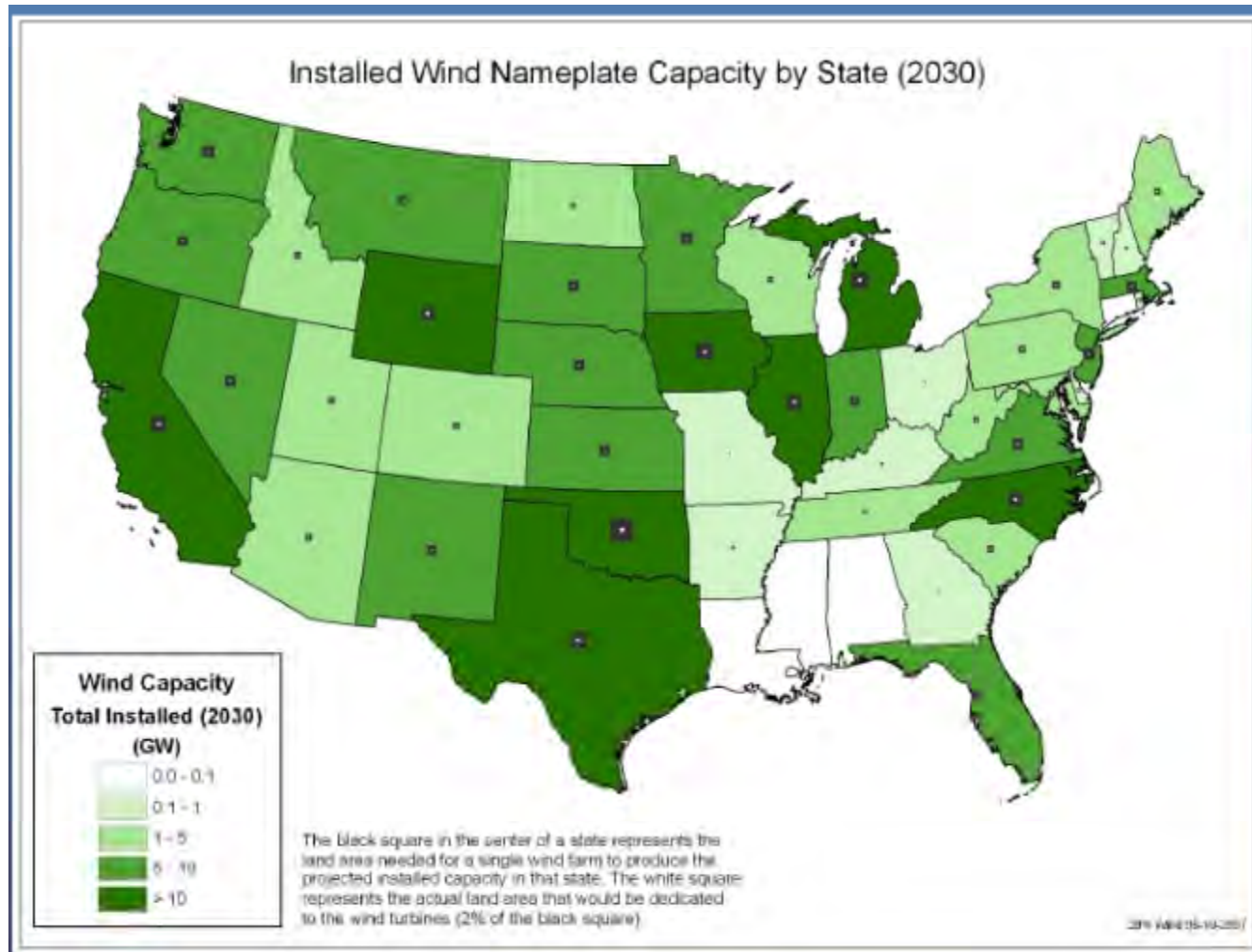
Iowa's Wind Energy Production



- Iowa is currently ranked 2nd in the nation in wind power (behind Texas)
- 2790 MW installed capacity = 825,000 homes powered

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Iowa – Economic Impacts

From the 20% Scenario; 10,000 MW new development

Wind energy's economic "ripple effect"

Direct Impacts

Payments to Landowners:

- \$55 Million/yr

Local Property Tax Revenue:

- \$90 Million/yr

Construction Phase:

- 33,200 new jobs
- \$3.8 B to local economies

Operational Phase:

- 5,200 new long-term jobs
- \$425 M/yr to local economies



Indirect & Induced Impacts

Construction Phase:

- 30,200 new jobs
- \$2.5 B to local economies

Operational Phase:

- 3,800 local jobs
- \$335 M/yr to local economies

Totals

(construction + 20yrs)

Total economic benefit =
\$21.4 B

New local jobs during
construction = 63,400

New local long-term jobs
= 9,000

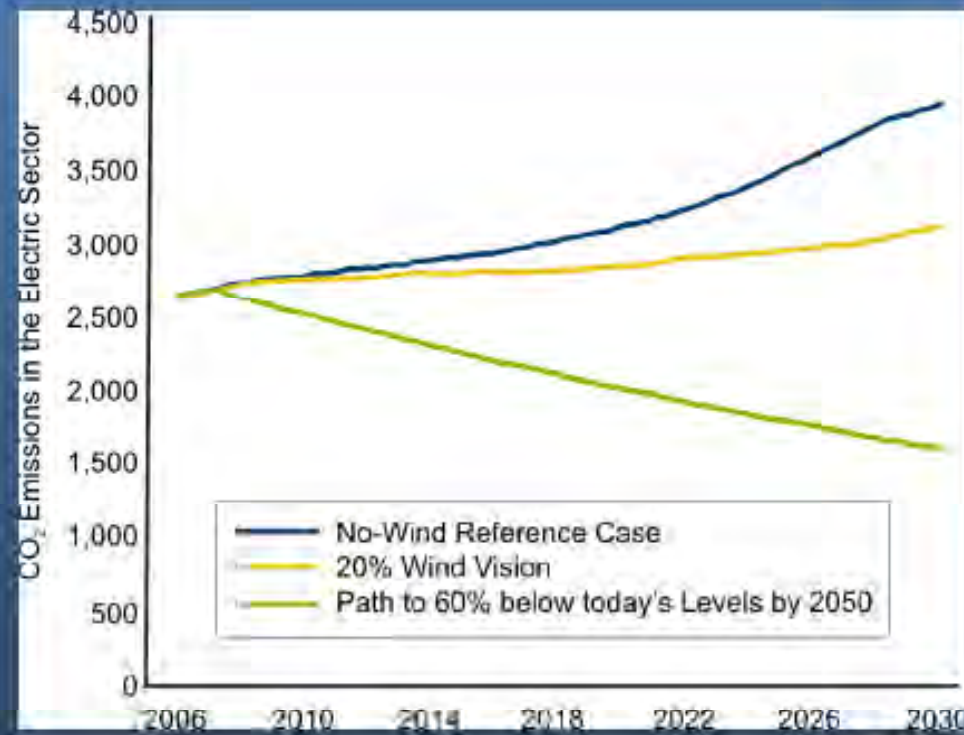
All jobs rounded to the nearest hundred jobs; Millions of dollars greater than 10 million are rounded to the nearest five million

Construction Phase = 1-2 years
Operational Phase = 20+ years

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Electric Sector CO₂ Emissions



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The Transmission Grid

- Historically has been built in increments
- Need national grid to access renewable energy and bring to market
- Renewable energy is far from where its needed
- Limiting factor for further wind energy development



Iowa's Biofuels Industry



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Leading the Way with Biofuels

- Iowa is the leading producer nationally of both ethanol and biodiesel
- As of November 2008, there were 35 ethanol refineries and 14 biodiesel refineries in Iowa
- This gives Iowa the production capacity for 3 billion gallons of ethanol and 317 million gallons of biodiesel

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1st Generation Challenges

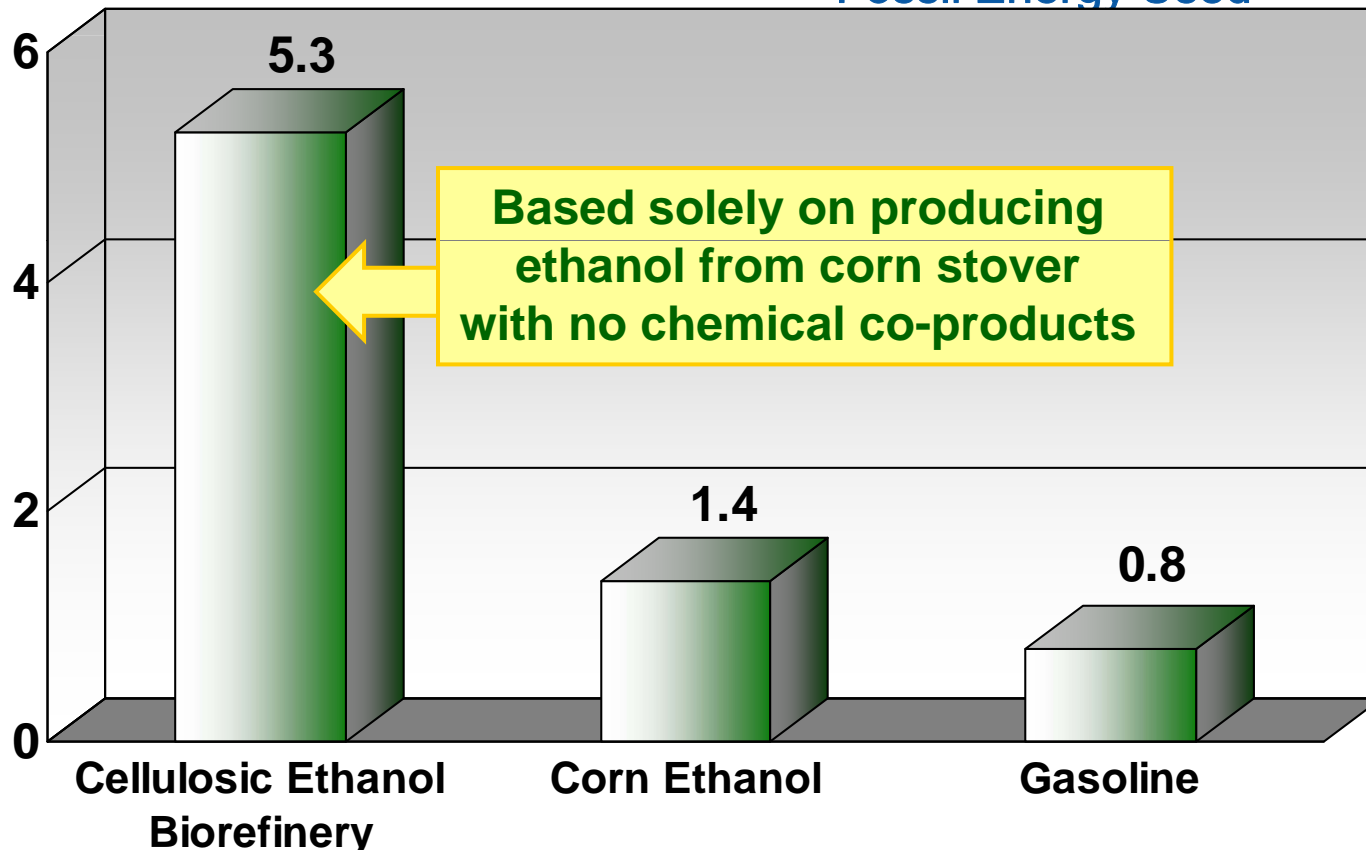
- Research is needed to continue to improve plant efficiencies, increase plant sustainability, and proper integration of second generation technology.
- Specific work is needed to evaluate and construct accurate models for the low carbon fuel standard.

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Fossil Energy Ratio

$$\text{Fossil Energy Ratio (FER)} = \frac{\text{Energy Delivered to Customer}}{\text{Fossil Energy Used}}$$



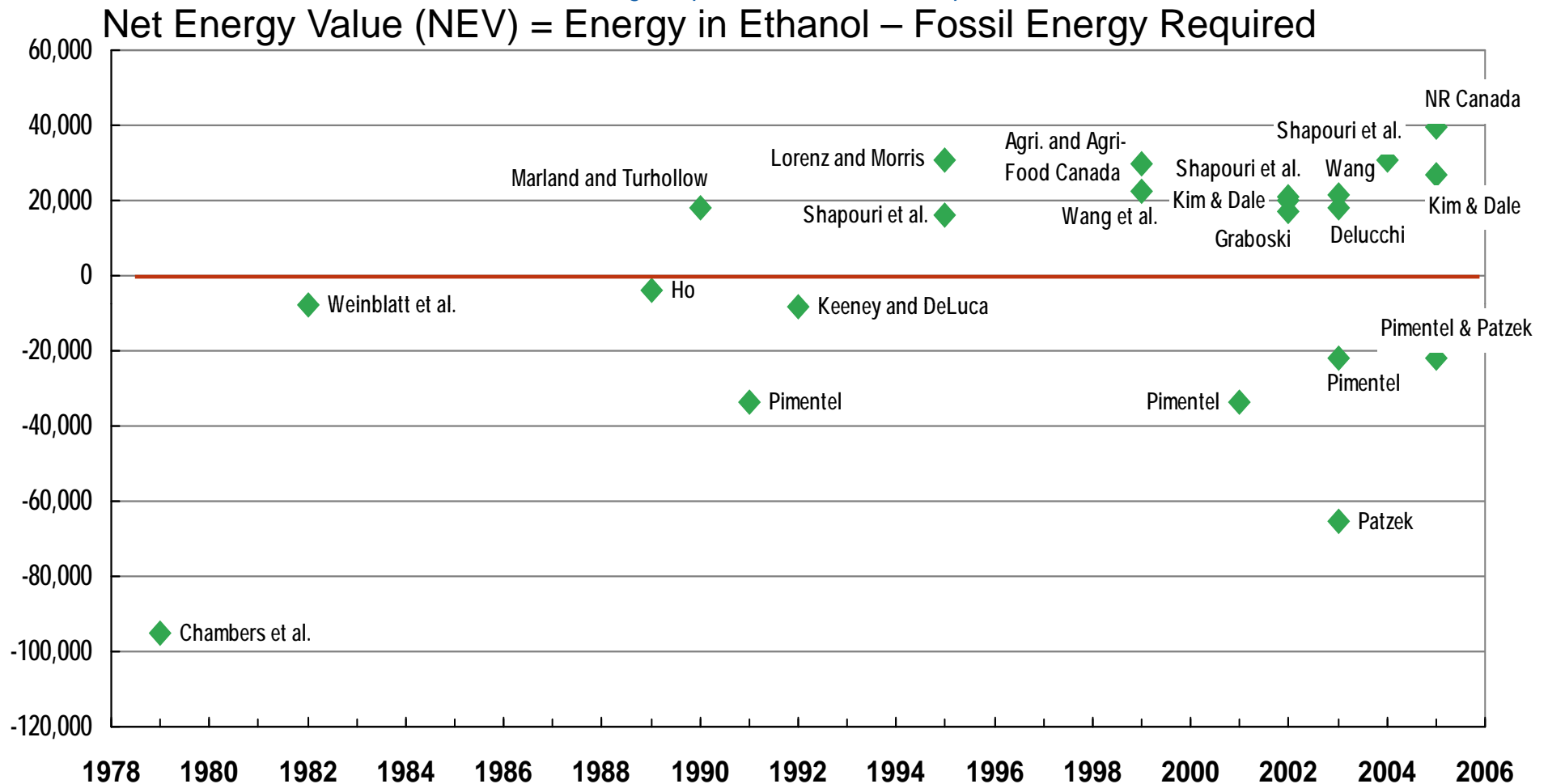
Source: J. Sheehan & M. Wang (2003)

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Corn Ethanol Energy Balance

Results among completed studies show an upturn.



Energy balance here is defined as the Btu content of a gallon of ethanol minus the fossil energy used to produce a gallon of ethanol.
Source: Argonne National Laboratory's review of past completed studies

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Low Carbon Fuel Standard

- Getting it right the first time is critical
- Present and future challenges
- Indirect land use issues



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Options for an Environmentally Sound Biomass Industry

- Set a specific percentage of renewable energy that will be generated from biomass



Other Renewable Energy Options



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Geothermal Energy

How Geothermal Energy is Used:

- Electricity Generation
- Direct Thermal Use and District Heating
- Geothermal Heat Pumps.



Power



Direct Use

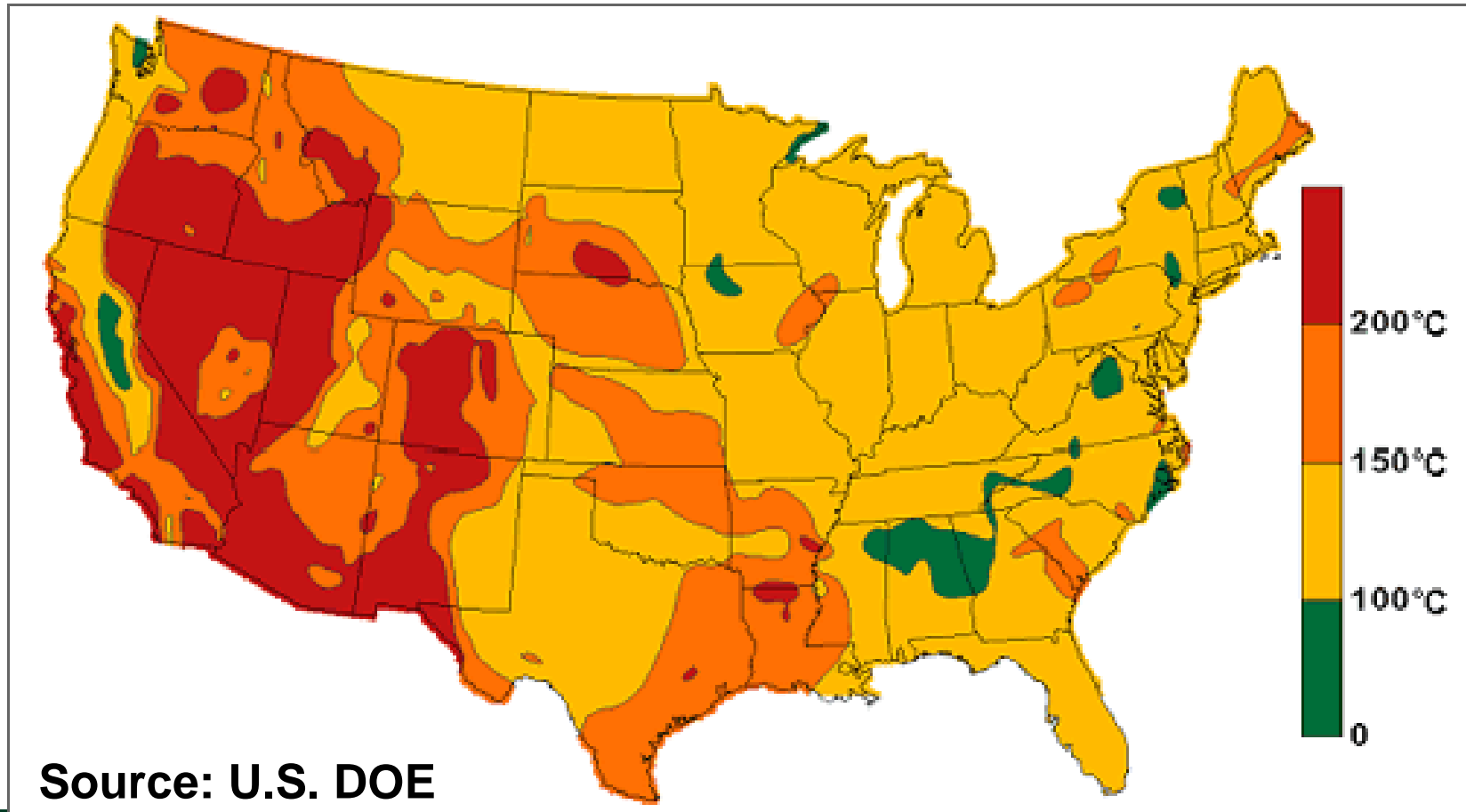


Geo Heat Pump

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Geothermal Potential at 6 kilometer (3.8 mile) depth



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Solar Energy

- Water heating available for domestic and industrial water systems
- Space heating and preheating
- On-grid systems



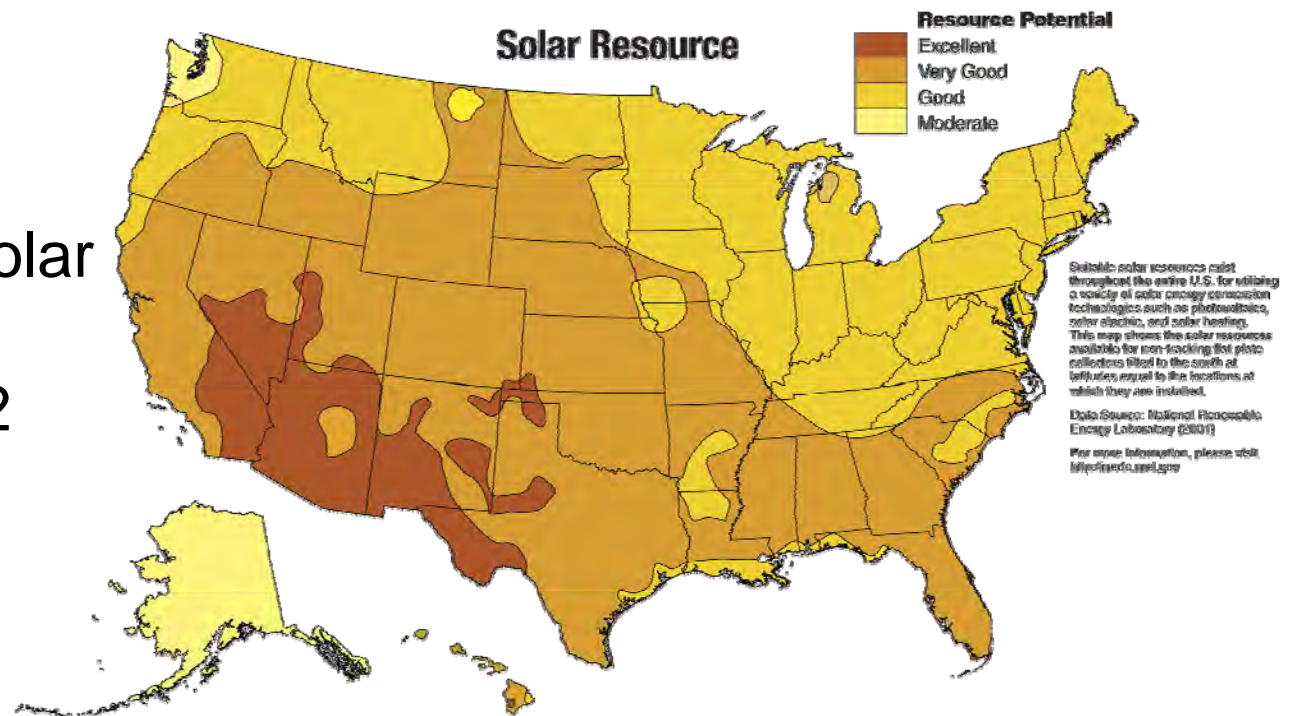
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Solar Outlook

DOE Solar Program goals

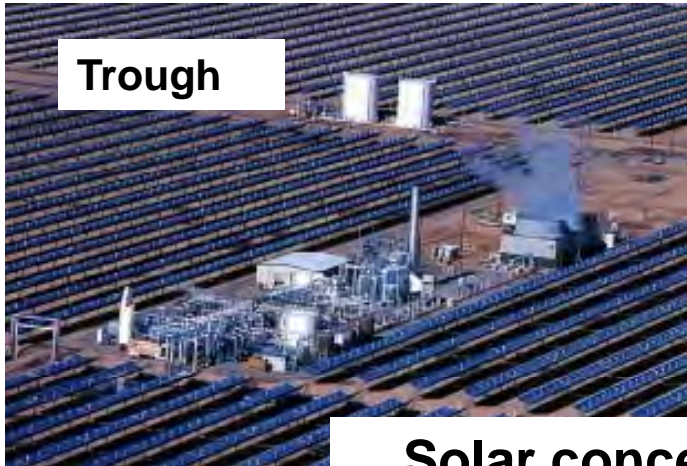
- Photovoltaics: 6¢/kWh by 2020
- Concentrating solar power/troughs: 5¢/KWh by 2012



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What is Concentrated Solar Power (CSP)?

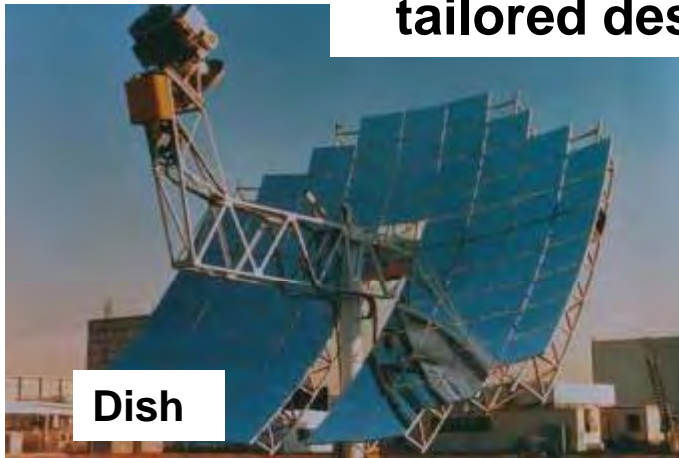


Trough



Tower

Solar concentration allows
tailored design approaches



Dish



CPV

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CSP Characteristics

- Ideally suited for multi-megawatt central power plants.
- Dispatchable power for peaking and intermediate loads through hybridization and/or thermal storage.
- Distributed power for grid support and remote applications.
- Proven technology with 354 MW operating successfully in California for the past 15 years.
- Rapidly deployed because it uses conventional items such as glass, steel, gears, turbines, etc.
- Water requirements similar to coal-fired plant.

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Anaerobic Digestion

- Converting waste into energy
- Iowa Power Fund Projects:
 - Amana Farms – demonstration and education project
 - Bison Renewables – large scale demonstration project

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9006 Anaerobic Digester Project

Vir-Clair Farms, Fond du Lac, WI

- Digester on 1,300 cow dairy farm
- Awarded \$299,580 grant
- Produces 2,500,000 kWh annually
- Electricity sold to Alliant Energy



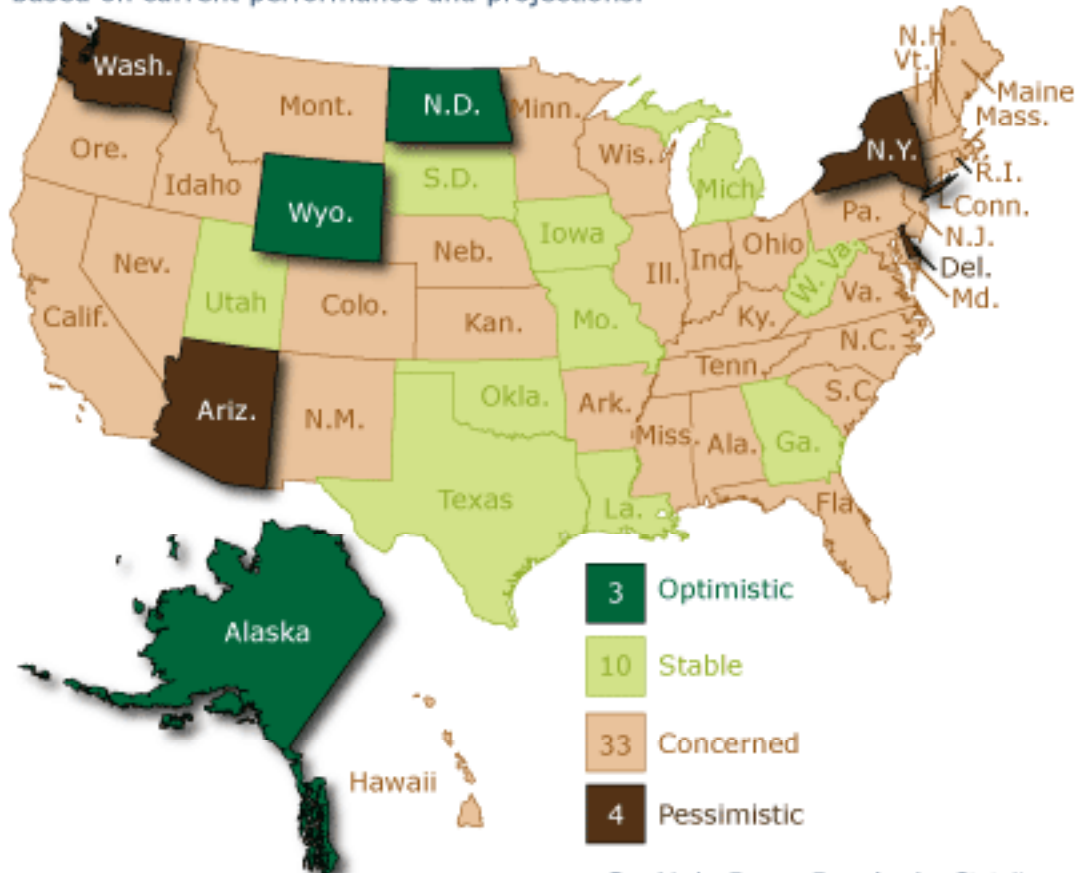
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Stateline.org

2009 states' revenue outlook

The National Conference of State Legislatures polled legislative fiscal directors from all 50 states to determine how they feel about their fiscal 2009 budgets, based on current performance and projections.



Graphic by **Danny Dougherty**, Stateline.org

Source: National Conference of State Legislatures State Budget Update: April 2008

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American Recovery & Reinvestment Act

- Federal stimulus package includes a lot of funding for energy initiatives:
 - The State Energy Program
 - Energy Efficiency and Conservation Block Grants
 - Energy Efficiency Rebates
 - More than \$25.5 billion in other competitive funding for renewable energy and energy efficiency

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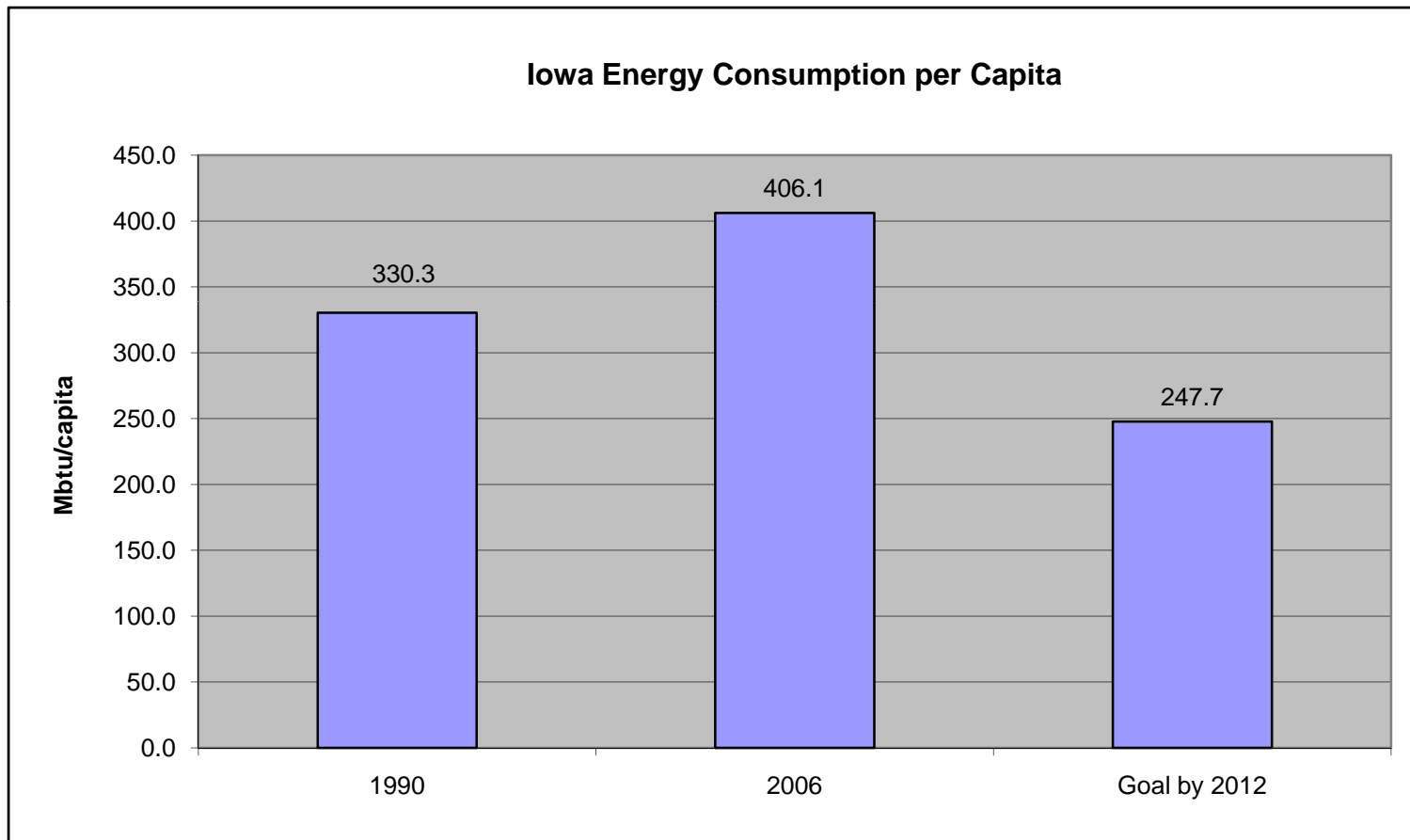
State Energy Program

- Goal: To reduce Iowa's per capita energy consumption by at least 25% of 1990 levels
- Approx. \$40.5 million
- Obligated by September 30, 2010

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State Energy Program Goal



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Energy Efficiency and Conservation Block Grants

Goal: To assist eligible entities in implementing strategies to reduce fossil fuel emissions, to reduce total energy use, and to improve energy efficiency

U.S. Department of Energy to announce state funding at a later date

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ENERGY EFFICIENCY AND CONSERVATION BLOCK GRANTS: \$2.8 Billion Nationally

- Large cities receive funding directly from U.S. DOE
- Small- to medium-sized cities receive funding through State Energy Program
- Each state decides how to award these sub-grants.
- All cities and counties are eligible to apply for competitive grants from DOE

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Energy Efficiency Rebates

- Funding is to replace appliances for consumers with Energy Star–rated appliances



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Where are we going?



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Recommendations for All Businesses

- Energy Audits
- Know your supply chain
- Know what is being used in fleets
- Net zero facilities
- Work hubs

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For further information

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515-281-0187

<http://www.energy.iowa.gov>

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